Space Weather Forecast

Issued on Wednesday, 04 January 2023 at 12:22 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of Moderate solar activity throughout. Chance of G1/Minor Geomagnetic Storm intervals on 04/05 January.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Low with occasional Common-class flares observed from the five regions on the visible disc. A moderately large and complex region in the northeast quadrant was the largest visible region. The remaining regions on the visible disc are all rather small and magnetically simple. A large region beyond the southeastern limb produced a long-period Common-class flare starting at 03/0620 UTC. This produced a large, fast CME (coronal mass ejection) which has been modelled, but does not have an Earth-directed component. No Earth-directed CMEs have been observed in available imagery. However, a filament lifted off from the central southern hemisphere between around 04/0300-0400UTC. Further imagery is awaited to model the associated CME, however initial images appear to indicate a faint and not particularly fast CME, with ejecta largely directed south of the Sun-Earth line.

Solar Wind / Geomagnetic Activity: Solar winds fluctuated at slightly elevated levels, between 400-450km/s. Magnetic field strength was initially weak but gradually increased through the period, more noticeably after 04/0130UTC, becoming strong and with an ongoing peak. The north-south component also became moderate and southward pointed for several hours after 04/0130UTC, before gradually rotating to a current weak northward orientation. Geomagnetic activity was initially Quiet before increasing to Unsettled to G1/Minor Storm (Kp 3-5) from 03/2100UTC, as observed by BGS.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) was at background with no solar radiation storms occurring.

Four-Day Space Weather Forecast Summary

Solar Activity: Mainly Low solar activity is expected on 04 January, with an increased chance of Moderate-class and Strong-class flares from 05 January due to the apparent active regions beyond the eastern limb, soon to become visible from Earth.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs are currently expected during the four-day forecast period. Solar wind speeds are presently at Slightly Elevated levels, owing to the likely passage of 30th December CME. Solar wind speeds are expected to rise either on 04 or 05 January (Day 1 or 2) due to a potential combination of fast winds from two coronal hole regions on the solar disc, which are forecast to connect with the Earth. Estimated speeds in the region of 450-500km/s are anticipated. These Slightly elevated to Elevated solar wind speeds are expected to persist to the end of the forecast period with a slow downward trend from the 05 or 06 January. Geomagnetic activity will generally be Unsettled through the next 24 hours, but with a risk of Active or G1/Minor Storm intervals due to residual CME effects and then the anticipated connection with one or more coronal holes later on 04 or early 05 January. Further

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G1/Minor Storm intervals are then possible through 05 January due to the effects of any coronal hole connection, with a return to Quiet to Unsettled conditions expected by 06 or 07 January (Day 3 or 4).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is forecast to remain at background with no solar radiation storms occurring. However, there is a slight chance of these rising in response to any larger flares that may occur, and perhaps exceeding the S1/Minor Radiation storm level.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	30	40	5	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	30	40	50	50
Very Active	R3 to R5 X	No	5	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	5	10	10	10
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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